What is claimed is:

C-2354

Claims

1. An oxygenated hydrocarbon fuel gas autothermal reformer assembly comprising:
a) a monolithic open cell foam core catalyst bed, said catalyst bed including an inlet end and an outlet end, an inlet portion of said catalyst bed being provided with a catalyst which is operable to combust a portion of the fuel gas so as to raise the temperature of said catalyst bed while minimizing carbon deposition in catalyzed cells of said foam core;
b) a fuel gas inlet passage, said fuel gas inlet passage being disposed in heat exchange relationship with an outlet processed fuel gas passage from said catalyst bed whereby heat will be transferred to said fuel gas inlet passage from the processed gas stream;
c) an air inlet passage, said air inlet passage being disposed in heat exchange relationship with processed gas stream whereby heat from the processed gas stream will be transferred to said air inlet passage; and
d) a fuel gas reforming catalyst deposited in said foam core catalyst bed.

2. The autothermal reformer assembly of Claim 1 wherein said catalyst includes a nobel metal and calcium oxide.

3. The autothermal reformer assembly of Claim 1 wherein said foam core catalyst bed comprises at least two catalyzed regions wherein each region has a different catalyst composition.

4. The autothermal reformer assembly of Claim 3 wherein a first region of said foam core catalyst bed contains a noble metal catalyst in combination with calcium oxide.

5. The autothermal reformer assembly of Claim 4 wherein a second region of said foam core catalyst bed contains a base metal catalyst in combination with calcium oxide.

6. The autothermal reformer assembly of Claim 5 wherein said first region of said

foam core catalyst bed contains a platinum catalyst, and said second region of said foam core catalyst bed contains a copper or copper/zinc catalyst.

7. The autothermal reformer assembly of Claim 4 wherein said first region of said foam core catalyst bed contains an iron oxide/calcium oxide catalyst and said second region of said foam core catalyst bed contains a copper or copper/zinc catalyst.

8. The autothermal reformer assembly of Claim 7 wherein said first region of said catalyst bed is further promoted with a noble metal catalyst.

9. The autothermal reformer assembly of Claim 8 wherein said noble metal catalyst is a catalyst selected from the group consisting of platinum, palladium and rhodium, or mixtures thereof.

10. The autothermal reformer assembly of Claim 1 wherein said foam core catalyst bed includes a first region which contains a noble metal and calcium oxide catalyst, and a subsequent region which does not contain calcium oxide and does contain said noble metal catalyst.

11. The autothermal reformer assembly of Claim 10 wherein said noble metal catalyst is selected from the group consisting of platinum, palladium and rhodium.

12. The autothermal reformer assembly of Claim 1 wherein said foam core catalyst bed includes at least one ceramic foam support body.

13. The autothermal reformer assembly of Claim 1 wherein said foam core catalyst bed includes a high temperature-compatable metal support selected from the group consisting of stainless steel, nickel alloys and iron-aluminum alloys.

14. The autothermal reformer assembly of Claim 13 wherein said metal support is connected to a source of electrical current so as to serve as a resistance heating element during start-up of said reformer assembly.

15. The autothermal reformer assembly of Claim 14 wherein said metal support is electrically heated to operating temperatures within about twenty seconds after applying electrical current thereto.

16. The autothermal reformer assembly of Claim 1 wherein said catalyst bed is cylindrical in shape.

17. The autothermal reformer assembly of Claim 1 wherein said fuel gas inlet passage contains a fuel gas/steam mixture.

18. The autothermal reformer assembly of Claim 1 wherein said air inlet passage contains an air/steam mixture.

19. The autothermal reformer assembly of Claim 1 wherein said fuel gas is methanol.

20. A methanol fuel gas reformer assembly comprising:
a) a cylindrical monolithic open cell foam core catalyst bed, said catalyst bed including an inlet end and an outlet end;
b) a fuel gas/steam mixture inlet passage; and
c) a fuel gas reforming catalyst deposited in said cylindrical foam core catalyst bed.

21. A methanol fuel gas autothermal reformer assembly comprising:
a) a monolithic open cell foam core catalyst bed, said catalyst bed including an inlet end and an outlet end, an inlet portion of said catalyst bed being provided with a catalyst which is operable to combust a portion of the fuel gas so as to raise the temperature of said catalyst bed while minimizing carbon deposition in catalyzed cells of said foam core; and
d) a fuel gas reforming catalyst deposited in said foam core catalyst bed.

22. An oxegenated hydrocarbon fuel gas autothermal reformer assembly comprising:
a) a monolithic open cell foam core catalyst bed, said catalyst bed including an inlet end and an outlet end, an inlet portion of said catalyst bed being provided with a noble metal-promoted catalyst which is operable to combust a portion of the fuel gas at a

temperature of about 200°F thereby enabling quick start up of the reformer while minimizing carbon deposition in catalyzed cells of said foam core;
b) a fuel gas inlet passage, said fuel gas inlet passage b ing disposed in heat exchange relationship with an outlet processed fuel gas passage from said catalyst bed whereby heat will be transferred to said fuel gas inlet passage from the processed gas stream;
c) an air inlet passage, said air inlet passage being disposed in heat exchange relationship with processed gas stream whereby heat from the processed gas stream will be transferred to said air inlet passage; and
d) a fuel gas reforming catalyst deposited in said foam core catalyst bed.

23. A methanol fuel gas autothermal reformer assembly comprising a monolithic open cell foam core catalyst bed, said catalyst bed including an inlet end and an outlet end, an inlet portion of said catalyst bed being provided with a noble metal-promoted catalyst which is operable to combust a portion of the fuel gas at a temperature of about 200°F thereby enabling quick start up of the reformer while minimizing carbon deposition in catalyzed cells of said foam core.